

CLAIMS

1. A magnetic read head comprising:
a current perpendicular to the planes (CPP) sensor;
the CPP sensor having a top cap layer structure; and
5 the cap layer structure being composed of ruthenium (Ru) or rhodium (Rh).
2. A magnetic read head as claimed in claim 1 wherein the material of the cap layer structure is ruthenium (Ru).
- 10 3. A magnetic read head as claimed in claim 1 wherein the material of the cap layer structure is rhodium (Rh).
4. A magnetic read head as claimed in claim 1 wherein the CPP sensor further comprises:
15 a ferromagnetic pinned layer structure;
a ferromagnetic free layer structure;
a nonmagnetic spacer layer located between the pinned layer structure and the free layer structure.
- 20 5. A magnetic read head as claimed in claim 4 further comprising:
ferromagnetic first and second shield layers;
the CPP sensor being located between the first and second shield layers; and
the first and second shield layers serving as first and second leads for conducting
a current through the CPP sensor in a direction perpendicular to major thin film planes of
25 the CPP sensor.
6. A magnetic read head as claimed in claim 5 wherein the material of the cap layer structure is ruthenium (Ru).

7. A magnetic read head as claimed in claim 6 wherein the free layer structure is located between the spacer layer and the cap layer structure.

8. A magnetic read head as claimed in claim 6 wherein the pinned layer structure is located between the spacer layer and the cap layer structure.

9. A magnetic read head as claimed in claim 5 wherein the material of the cap layer structure is rhodium (Rh).

10. A magnetic read head as claimed in claim 9 wherein the free layer structure is located between the spacer layer and the cap layer structure.

11. A magnetic read head as claimed in claim 10 wherein the pinned layer structure is located between the spacer layer and the cap layer structure.

12. A magnetic head assembly comprising:

a write head;

a read head adjacent the write head;

the read head comprising:

a current perpendicular to the planes (CPP) sensor;

the CPP sensor having a top cap layer structure; and

the cap layer structure being composed of ruthenium (Ru) or rhodium (Rh).

13. A magnetic head assembly as claimed in claim 12 wherein the CPP sensor further comprises:

a ferromagnetic pinned layer structure;

a ferromagnetic free layer structure;

a nonmagnetic spacer layer located between the pinned layer structure and the free layer structure.

5 14. A magnetic head assembly as claimed in claim 13 further comprising:
ferromagnetic first and second shield layers;
the CPP sensor being located between the first and second shield layers; and
the first and second shield layers serving as first and second leads for conducting
a current through the CPP sensor in a direction perpendicular to major thin film planes of
the CPP sensor.

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15 15. A magnetic head assembly as claimed in claim 14 wherein the material of
the cap layer structure is ruthenium (Ru).

15 16. A magnetic head assembly as claimed in claim 14 wherein the material of
the cap layer structure is rhodium (Rh).

20 17. A magnetic disk drive comprising:
at least one magnetic head assembly that has a head surface;
the magnetic head assembly having a write head and a read head;
the read head including:
a current perpendicular to the planes (CPP) sensor;
the CPP sensor having a top cap layer structure; and
the cap layer structure being composed of ruthenium (Ru) or rhodium
(Rh);
25 ferromagnetic first and second shield layers; and
the CPP sensor being located between the first and second shield layers;
a housing;
a magnetic medium supported in the housing;

a support mounted in the housing for supporting the magnetic head assembly with said head surface facing the magnetic medium so that the magnetic head assembly is in a transducing relationship with the magnetic medium;

a motor for moving the magnetic medium; and

5 a processor connected to the magnetic head assembly and to the motor for exchanging signals with the magnetic head assembly and for controlling movement of the magnetic medium.

10 18. A magnetic disk drive as claimed in claim 17 wherein the CPP sensor further comprises:

a ferromagnetic pinned layer structure;

a ferromagnetic free layer structure;

a nonmagnetic spacer layer located between the pinned layer structure and the free layer structure.

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19. A magnetic disk drive as claimed in claim 18 wherein the material of the cap layer structure is ruthenium (Ru).

20 20. A magnetic disk drive as claimed in claim 18 wherein the material of the cap layer structure is rhodium (Rh).

21. A magnetic read head comprising:

a current perpendicular to the planes (CPP) sensor;

the CPP sensor having a top cap layer structure which includes:

25 a first layer of tantalum (Ta) only;

a second layer of ruthenium (Ru), rhodium (Rh) or gold (Au); and

the first layer being located between and interfacing a spacer layer and the second layer.

22. A magnetic read head as claimed in claim 21 wherein the second layer is ruthenium (Ru).

23. A magnetic read head as claimed in claim 21 wherein the second layer is
5 rhodium (Rh).

24. A magnetic read head as claimed in claim 21 wherein the second layer is gold (Au).

10 25. A method of making a read head with a current perpendicular to the planes (CPP) sensor comprising the steps of:

providing a sputtering chamber with a vacuum;

sputtering within the chamber a cap layer structure of the CPP sensor wherein the cap layer structure has a first layer of tantalum (Ta) and a second layer selected from the
15 group consisting of ruthenium (Ru), rhodium (Rh) or gold (Au);

the first layer being sputtered in the chamber with said vacuum; and

the second layer being sputtered in the chamber on the first layer without breaking said vacuum.

20 26. A method as claimed in claim 25 wherein the second layer is formed of ruthenium (Ru).

27. A method as claimed in claim 25 wherein the second layer is formed of
rhodium (Rh).

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28. A method as claimed in claim 25 wherein the second layer is formed of gold (Au).